

If-Then Planning Helps School-Aged Children to Ignore Attractive Distractions

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Abstract. Can children improve shielding an ongoing task from distractions by if-then planning (i.e., by forming implementation intentions)? In an experimental study, the situational and personal limits of action control by distraction-inhibiting implementation intentions (“If a distraction comes up, then I will ignore it!”) were tested by comparing them to simple goal intentions (“I will ignore distractions!”). Goal intentions were sufficient to successfully ignore distractions of low attractiveness. In the presence of moderately and highly attractive distractions, as well as a distraction presented out of the children’s sight, however, only implementation intentions improved children’s task shielding, as indicated by faster response times in an ongoing categorization task and shorter periods of looking at highly attractive distractions presented out of their field of vision. These findings held true regardless of the children’s temperament and language competency. Implications for research on planning and developmental research on self-control are discussed.

Keywords: task shielding, goal intention, implementation intention, self-control, resistance-to-temptation, development, temperament

Self-control is a crucial prerequisite for successful attainment of goals (Bandura, 1997), influencing many domains of life, such as social adjustment, health status, and academic achievement (Baumeister, Heatherton, & Tice, 1994). A key feature of successful self-control is the motivation and ability to shield one’s goal-related behavior from distractions (Dreisbach & Haider, 2009; Goschke & Dreisbach, 2008; Shah, Friedman, & Kruglanski, 2002; Veling & van Knippenberg, 2006). The importance of this shielding aspect of self-control is highlighted by findings showing a positive association between children’s performance in delay-of-gratification and resistance-to-temptation paradigms and positive developmental outcomes during childhood, adolescence, and adulthood, such as focused attention, concentration, tolerance of frustration, self-control, academic achievement, social competence, and reduced propensity for drug abuse (Ayduk et al., 2000; Eigsti et al., 2006; Eisenberg, Fabes, Guthrie, & Reiser, 2000; Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990). A child’s ability to resist a puppet clown’s offer to play in order to continue with the tedious main task of putting pegs in a pegboard (Mischel & Patterson, 1976) was a valuable predictor for success in shielding self-control tasks later on in life. Given this relative stability of shielding capabilities, it is now important to test

whether the limited self-control of young children can be improved.

Generally, an effective strategy to facilitate goal striving in task performance is to forge specific if-then plans. Such plans help an individual to get started, to stay on track, to disengage on time, and to manage resources for self-control during goal pursuit (Gollwitzer, 1999). Most studies on implementation intentions have targeted the problem of not getting started with an intended goal-directed action (for a meta-analysis, see Gollwitzer & Sheeran, 2006). However, in addition to getting started, the challenge of goal attainment often pertains to continuation of goal striving in the face of distractions until the desired goal is successfully attained. In the present study, therefore, we sought to test whether children become more effective at shielding their goal striving with the use of implementation intentions.

Implementation intentions support goal intentions. Whereas goal intentions in the format “I intend to achieve outcome X/to perform behavior X!” describe desired end states and represent the result of the process of goal setting, implementation intentions additionally spell out in advance when, where, and how these goals should be realized. Implementation intentions are especially effective when they use an if-then format (“If situation Y arises, then I will perform action Z!”; e.g., Chapman, Armitage, & Norman,

2009). The if-component of an implementation intention describes a concrete situation that qualifies as a good opportunity to act. The then-component specifies an instrumental goal-directed response. For example, a child could support the goal to stay on track while doing homework with the implementation intention, "If I am in the middle of doing my homework, then I will ignore incoming text messages on my mobile!" The positive consequence of pre-defining one's goal striving in this way is that when text messages arrive, one does not have to reflect any longer on whether to read and answer them or not. Rather, getting involved with working on the exercises directly triggers the linked behavior of ignoring incoming text messages.

Research on the processes underlying the effectiveness of implementation intentions has pointed to two processes that mediate their effects on goal attainment. First, specifying a situational cue in the if-component of an implementation intention increases the cue's mental accessibility, ensuring that the critical situation will not be missed (e.g., Aarts, Dijksterhuis, & Midden, 1999). Second, a strong cue-behavior link is established (Webb & Sheeran, 2008), such that the presence of the specified cue automatically elicits the linked response. Consequently, action control by implementation intentions carries features of automaticity: It is immediate (Gollwitzer & Brandstätter, 1997), efficient (Brandstätter, Lengfelder, & Gollwitzer, 2001), difficult to halt (Wieber & Sassenberg, 2006), redundant of conscious intent (Bayer, Achtziger, Gollwitzer, & Moskowitz, 2009), and does not tax self-control resources (Webb & Sheeran, 2003).

Various studies provide evidence for the effectiveness of implementation intentions to improve people's goal shielding in the face of distractions. For instance, in a field study, people who added specific implementation intentions to their goal intention to reduce their weight were more successful in controlling their disruptive thoughts (i.e., cravings) during dieting than those who followed simple goal intentions (Achtziger, Gollwitzer, & Sheeran, 2008, Study 1). In a further field study, implementation intentions helped tennis players to control their disruptive feelings (e.g., performance anxiety, irritation) during sports events (Achtziger et al., 2008, Study 2). In experimental studies, it has been observed that implementation intentions help people to ignore distractions (Gollwitzer & Schaal, 1998; Parks-Stamm, Gollwitzer, & Oettingen, 2010). In one study, participants pursued the goal to avoid getting distracted while they performed a lengthy concentration task; during the task, award-winning advertisement videos were shown. Participants with additional distraction-inhibiting implementation intentions ("As soon as I see moving pictures or hear some sound, I will ignore them!"; Gollwitzer & Schaal, 1998, p. 129) performed better on the concentration test; this was true for participants with both high and low motivation to perform well on the test. With respect to task-facilitating implementation intentions ("As soon as I see moving pictures or hear some sound, I will increase my efforts on the arithmetic task!"; Gollwitzer & Schaal, 1998,

p. 129), test performance improvements were observed only for participants with a low motivation to perform well. Similarly, test-anxious college students' performance on a math exam increased with distraction-inhibiting plans, but not with task-facilitating plans (Parks-Stamm et al., 2010). Building on these studies, it is important to gain more insight into the processes underlying the effects of distraction-inhibiting implementation intentions as well as their limits, as this type of implementation intention has been particularly effective in helping people to shield ongoing goal striving from intrusive distractions.

The Present Research

As outlined above, the if-then structure is central to the effectiveness of implementation intentions as both processes that mediate implementation intention effects on action control (i.e., the heightened accessibility of the if-component as well as the built-in if-then link) rely on it (see also Chapman et al., 2009). In previous studies (see meta-analysis by Gollwitzer & Sheeran, 2006), however, participants in the implementation intention condition often received useful task strategies within the phrasing of the implementation intention that participants in the goal intention condition did not receive. Studies testing the positive effects of if-then plans need to hold people's knowledge of behavioral strategies constant and should solely manipulate the if-then format between the implementation intention and the goal intention. Thus, to test the implementation intention effect without such differentiated strategy information between conditions, we compared shielding implementation intentions with shielding goal intentions in the present study. Both intention conditions included the same behavioral strategy (i.e., to ignore distractions). The shielding goal intention, however, lacked the respective if-component (i.e., "And if a distraction comes up") that is assumed to be responsible for automating the initiation of the behavioral strategy in response to the specified situation (Gollwitzer, 1999). Consequently, participants who planned in an if-then format were predicted to shield ongoing task performance more effectively against distractions than those with a simple goal intention.

Furthermore, we tested whether 6-year-old children could make use of assigned plans in an if-then format that link an anticipated critical situation to a response that might help them to cope with it. Although 6-year-old children are generally capable of if-then thinking and can improve their behavior regulation when alternative responses to a distraction are made accessible to them in assigned plans, they usually do not make such plans on their own (Mischel & Patterson, 1976). Inviting children of about this age to participate in research thereby helps minimize the chance that participants with simple goal intentions spontaneously make an if-then plan. The present study represents a strong test of the effectiveness of task shielding with implemen-

tation intentions, because younger children tend to be more prone to distractions than older children, because of their immature self-control skills (e.g., Calkins & Williford, 2009; Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Suchodoletz, Trommsdorff, Heikamp, Wieber, & Gollwitzer, 2009); additionally, younger children have a limited capacity to utilize complex cognitive strategies (e.g., Kopp, 1982; Zelazo, Carter, Reznick, & Frye, 1997).

Regarding the limits of implementation intentions to improve the shielding of an ongoing task, we addressed their effectiveness in situations where such shielding was required to a varying extent (Task 1). When shielding is relatively simple, goal intentions might be sufficient to pursue one's goals successfully. When shielding becomes more difficult, however, implementation intentions are necessary to maintain task performance. In line with this reasoning, implementation intentions have been found to function best when task performance becomes difficult (Gollwitzer & Brandstätter, 1997, Study 1). For instance, compared to forming simple goal intentions, adding implementation intentions helped students to follow through with their tasks over Christmas break with respect to difficult goals, but no differences between simple goal intentions and additional implementation intentions were observed for easy-to-implement tasks (Gollwitzer & Brandstätter, 1997, Study 1). Accordingly, we expected that relative to children who formed only goal intentions, those who formed implementation intentions would perform comparatively better on a categorization task in the face of moderately and highly attractive distractions, but not when confronted with less attractive distractions.

The proximity of the distractions can be considered to be a second potential limitation of the effectiveness of implementation intentions. Therefore, we separately addressed the question of whether the positive effects of shielding implementation intentions (as compared to simple goal intentions) hold up even when highly attractive distractions were presented outside the children's field of vision (Task 2), such that the children had to turn their heads around to see the distractions (Genshaft, 1983; Hartig & Kanfer, 1973; Mischel & Patterson, 1976). As controlling the urge to turn one's head around can be assumed to be less difficult than controlling one's eye movements toward distractions presented in one's line of sight, simple shielding goal intentions might suffice to ignore distractions presented outside one's field of vision. Accordingly, we did not expect that children in the two intention conditions would differ regarding the frequency of looking at the external distractions. If children do turn their head to the distraction, however, the question arises as to under which condition they will return more quickly to the ongoing task. As simple goal intentions lack the automated association between the distraction (the if-component of the implementation intention) and the behavioral response to ignore the distraction (the then-component), those in the implementation intention condition should return their attention to the ongoing task more quickly than those who formed simple goal intentions.

In addition to such situational context moderators, the effects of if-then planning on shielding an ongoing task might also be influenced by personality differences. Developmental psychology research reports that both temperament and language competence relate to children's self-control (Eisenberg, Hofer, & Vaughan, 2007; Eisenberg & Sadovsky, 2006; Grolnick, Farkas, & Bornstein, 2002; Kochanska & Knaack, 2003; Kochanska, Murray, & Harlan, 2000; Kopp, 1982; McCabe, Cunningham, & Brooks-Gunn, 2004). Temperament is defined as an individual difference in reactivity and the motivation and ability to effortfully regulate emotional, attentional, or motoric responses (Rothbart, Ellis, & Posner, 2004). More specifically, higher levels on the temperament dimension of "effortful control" enable children to inhibit a dominant response more successfully and/or to activate a subdominant response (Rothbart & Bates, 2006), which seems useful when one has to resist a distraction. Children's verbal competencies are also related to self-control (e.g., Barkley, 1997; Kopp, 1982). For instance, inner speech as a cognitive self-regulation tool is positively related to children's attention deployment capabilities (Winsler, Diaz, McCarthy, Atencio, & Chabay, 1999). Accordingly, we addressed the question of whether children would benefit from implementation intentions even when controlling for their temperament and language competency.

Method

Design and Participants

The study used a 2 between (Shielding Intention: goal intention vs. implementation intention) \times 3 within (Distraction Attractiveness: low vs. moderate vs. high) mixed-factorial design with the average response time differences between Task 1 baseline trials (i.e., categorization trials without distractions) and Task 1 critical trials (i.e., categorization trials that showed a distraction in the children's line of sight) as the first dependent variable (Task 1).

Moreover, we assessed how highly attractive distractions (movies) that were presented out of the children's sight would affect their responses. With respect to the out-of-sight distractions, we used a 2 between (Shielding Intention: goal intention vs. implementation intention) factorial design with the average response time differences between Task 2 baseline trials (i.e., trials without distractions) and Task 2 critical trials (i.e., trials that showed a distraction out of the children's sight) as the second dependent variable (Task 2). Forty-nine children (26 f. female) with a mean age of 6 years 9 months ($SD = 9$ months; range: 5 years 6 months to 8 years 5 months) from families with middle-class socioeconomic backgrounds participated in the study; they received compensation of a toy valued at EUR 5.

Measures

In-Sight Distraction Task (Task 1)

Children categorized vehicles (ship, car, truck, train, or plane) versus animals (cat, cow, dog, chicken, pig, or mouse) by pressing the left or right key, respectively, on a two-button keyboard with their index fingers. Each trial started with a 500 ms fixation-cross, followed by a vehicle or animal picture (both 7.11 cm tall by 10.67 cm wide) that was presented in the lower half of the screen until the child responded, with a 1500 ms interstimulus interval (ISI) between trials. In Task 1, 30 baseline categorization trials without distraction stimuli were followed by 90 trials with distraction stimuli of low, moderate, and high attractiveness (30 trials each). The distracting stimuli of varying attractiveness were presented in the upper half of the screen (i.e., in the children's line of sight) simultaneously with the categorization task pictures.

Out-of-Sight Distraction Task (Task 2)

The out-of-sight distraction task used the same categorization task to measure children's shielding performance. In Task 2, 30 baseline categorization trials were followed by 90 trials; these 90 trials were presented while a continuous 2 min loop of a highly attractive animated cartoon movie sequences was shown on a separate 21-inch television. This television was placed on the left side of the child (at a 90-degree angle) at a distance of about 3 m (i.e., out of the children's sight). The children's direction of gaze was recorded with a video camera. For quantitative data analysis, frequency and duration of departures of attention from the screen were coded. Because of technical problems, tapes of only 34 children out of 49 were recorded successfully.

Personality Characteristic Measures

To measure children's temperament, mothers filled out the effortful-control subscales Attentional Focusing, Inhibitory Control, Low Pleasure, and Perceptual Sensitivity (26 items, e.g., "My child can wait before starting new activities if s/he is asked to") of the Children's Behavior Questionnaire (CBQ; Rothbart, Ahadi, Hersey, & Fisher, 2001). The children's receptive language skills were measured using age-standardized T-values of the subtest Comprehension of Grammatical Structures of the Heidelberg Test of Language Development (HSET; Grimm & Schöler, 1991).

Procedure

Mothers brought their children to two sessions. During the first meeting, the CBQ (Rothbart et al., 2001) was administered (see above). In the second session, the classification

tasks were performed. Children first completed the HSET (Grimm & Schöler, 1991) and then the upcoming classification tasks were explained to them; they worked through 12 sample trials before their shielding intentions were manipulated. All of the children received the task instruction to answer all categorization problems correctly and as quickly as possible. Finally, children were randomly assigned either to the shielding goal intention ("I will ignore distractions!") or to the shielding implementation intention ("If there is a distraction, then I will ignore it!") condition.

To ensure their understanding of the procedure, the children had to explain the classification task, the potential distractions, and their shielding intention back to the experimenter. They then indicated their commitment to perform well on the classification task ("How important is it for you to perform as well as possible in the animal or vehicle task?") and perceived self-efficacy ("How easy is the task for you?", "Do you think you are good at this task?", "How difficult is the task for you?" (reversed); $\alpha = .67$) on Likert scales ranging from 1 (*not at all*) to 7 (*very much*).

Next, the children worked on the in-sight distraction task (Task 1). After 30 categorization task trials without distractions (baseline measurement), 30 categorization trials with distractions of low attractiveness, 30 categorization trials with moderately attractive distractions, and 30 categorization trials with highly attractive distractions followed.

Before working on the out-of-sight distraction task (Task 2), all children repeated their intentions together with the experimenter. During the out-of-sight distraction task, children worked on 30 problems without distractions (baseline measurement Task 2) before completing 90 categorization problems in the presence of the endless loop of the animated cartoon movie sequence. In a final questionnaire, children again rated their goal commitment and perceived self-efficacy in performing the classification task. They were also asked whether they had made any additional strategies. Finally, children and their mothers were debriefed, compensated, and thanked for their participation.

Results

Pretest Distraction Attractiveness

The attractiveness of the distraction stimuli used in Tasks 1 and 2 was pretested with 6- to 7-year-old children ($N = 20$). In comparison to ten 2.54 cm by 2.54 cm black-and-white smiley pictures ($M = 4.62$, $SD = 0.91$), ten 7.11 cm by 11.68 cm cartoon pictures were rated as moderately attractive ($M = 5.35$, $SD = 0.76$), and ten 8.13 cm by 11.18 cm 4 s cartoon movie sequences were rated as highly attractive ($M = 6.14$, $SD = 0.51$) on 7-point Likert scales, $F(2, 18) = 42.81$, $p < .001$, $\eta^2_p > .82$.

Control Variables

To ensure the equality of both intention conditions, children's temperament ($M_{\text{goal intention (gi)}} = 5.52$, $SD = 0.62$; $M_{\text{implementation intention (ii)}} = 5.52$, $SD = 0.50$) and their receptive language competence ($M_{\text{gi}} = 42.15$, $SD = 8.35$; $M_{\text{ii}} = 40.70$, $SD = 7.81$) was compared; no differences were found, all F values < 2.22 , p values $> .14$, $\eta^2_p < .05$. For the same reason, the ratio of boys to girls (approximately 50% of each gender) and school experience (approximately 50% Kindergarten, 50% first grade) was held constant between the intention conditions. Further, children in both conditions successfully learned the task instructions and intentions. Their goal commitment ($M_{\text{gi}} = 4.51$, $SD_{\text{gi}} = 0.74$; $M_{\text{ii}} = 4.08$, $SD_{\text{ii}} = 1.17$) and self-efficacy ($M_{\text{gi}} = 5.29$, $SD_{\text{gi}} = 0.88$; $M_{\text{ii}} = 5.01$, $SD_{\text{ii}} = 0.97$) were equally high in both intention conditions in the initial as well as the final questionnaire, all F values < 1 , p values $> .40$, $\eta^2_p < .02$.

Moreover, baseline measurements before Task 1 and Task 2 revealed no differences between intention conditions in terms of response times (RTs; see Table 1), both F values (1, 47) < 1.16 , p values $> .28$, $\eta^2_p < .03$, or in terms of error rates (Task 1: $M_{\text{gi}} = 3.75\%$, $SD_{\text{gi}} = 2.85\%$ and $M_{\text{ii}} = 4.11\%$, $SD_{\text{ii}} = 2.90\%$; Task 2: $M_{\text{gi}} = 3.96\%$, $SD_{\text{gi}} = 2.26\%$ and $M_{\text{ii}} = 2.82\%$, $SD_{\text{ii}} = 3.32\%$), both F values (1, 47) < 2.01 , $p > .16$, $\eta^2_p < .05$. RTs for error trials of Task 1 and of Task 2 were excluded from the analysis. Finally, separate t -tests revealed neither differences between Kindergarten and first-grade children on any of the RT indices, all $ts(47) < 1.62$, all p values $> .11$, nor gender differences, all $ts(47) < 1.6$, all p values $> .12$. As an exception, differences in RTs of categorization problems presented with distractions and those presented without distractions in Task 2 differed between boys and girls: Boys were more distracted ($M = 380.33$ ms, $SD = 540.67$ ms) than girls ($M = 135.45$ ms, $SD = 284.51$ ms), $F(1, 47) = 7.08$, $p < .05$, $\eta^2_p = .13$. Computing separate ANOVAs for each intention condition showed that these differences came from the goal

intention condition, in which boys were more distracted ($M = 523.31$ ms, $SD = 613.75$ ms) than girls ($M = 234.28$ ms, $SD = 358.11$ ms), $F(1, 24) = 5.33$, $p < .05$, $\eta^2_p = .18$. In the implementation intention condition, however, boys and girls showed comparably low distraction scores ($M_{\text{boys}} = 96.92$ ms, $SD_{\text{boys}} = 191.32$ ms; $M_{\text{girls}} = 58.45$ ms, $SD_{\text{girls}} = 156.27$ ms), $F(1, 21) < 1.00$, $p > .28$, $\eta^2_p < .02$.

In-Sight Distraction Task Performance (Task 1)

To test the predicted differential effects of simple goal intentions vs. implementation intentions on the classification performance while distractions of varying attractiveness were present, the logarithmized RT means of correct categorizations in the critical trials minus the logarithmized RT means of correct categorizations in the baseline trials were subjected to a Shielding Intention \times Distraction Attractiveness repeated-measures ANOVA. A main effect of distraction attractiveness was obtained, $F(2, 46) = 8.79$, $p < .01$, $\eta^2_p > .27$. Children's classification responses became slower with increasing attractiveness of distractions ($M = 57.25$ ms, $SD = 190.98$ ms; $M = 257.69$ ms, $SD = 379.45$ ms; $M = 630.44$ ms, $SD = 1319.48$ ms, from low to high; see Table 1). In addition, a main effect of shielding intention was observed, $F(2, 46) = 4.86$, $p < .05$, $\eta^2_p > .09$. Children responded more slowly in the goal intention condition ($M = 469.15$ ms, $SD = 109.94$ ms) than in the implementation intention condition ($M = 141.01$ ms, $SD = 116.89$ ms). These effects were qualified by the expected two-way interaction effect, $F(2, 46) = 3.57$, $p < .05$, $\eta^2_p > .13$.

Children's RTs were determined by the attractiveness of the distraction (i.e., the more attractive the distraction, the slower the response) when they had formed a goal intention but not when they had formed an implementation intention. Planned single comparisons revealed that RTs of the intention conditions did not differ when distractions of low attractiveness were present, $t(47) = 0.18$, $p > .85$, $\eta^2_p < .01$, but did in the presence of moderately and highly attractive distractions, both $ts(47) > 2.08$, p values $< .05$, $\eta^2_p > .08$. Children in the implementation intention condition responded more quickly in the face of moderately and highly attractive distractions than those in the shielding goal intention condition. Including temperament and language competence as covariates in the reported analyses changed neither the reported Distraction Attractiveness \times Shielding Intentions interaction effect, $F(2, 44) = 3.79$, $p < .05$, $\eta^2_p > .14$, nor the previously cited results.

Out-of-Sight Distraction Task Performance (Task 2)

To test the predicted differential effects of simple goal intentions vs. implementation intentions on the classification

Table 1. Baseline response times and mean response time differences (critical trials minus baseline trials) in ms (SD) as a function of shielding intention and distraction ($N = 49$)

Distraction	Shielding intention	
	Goal intention	Implementation intention
	Task 1 (Distractions in the line of sight)	
None (Baseline)	852.24 (169.16)	802.83 (162.51)
Low attractiveness	62.00 (293.74)	51.88 (179.85)
Moderate attractiveness	373.80 (423.14)	126.44 (277.01)
High attractiveness	971.67 (1668.29)	244.71 (585.39)
	Task 2 (Distractions out of the line of sight)	
None (Baseline)	950.56 (268.60)	904.37 (223.44)
High attractiveness	406.88 (537.10)	73.50 (167.66)

performance while a highly attractive movie sequence was presented out of the children's line of sight, the logarithmized RT means of correct categorizations in Task 2 minus the logarithmized RT means of correct categorizations in the baseline trials in Task 2 were subjected to an univariate ANOVA. As with the attractive distractions presented in the children's sight (Task 1), children who formed a goal intention showed slower RTs ($M = 406.88$ ms, $SD = 537.10$ ms; see Table 1) in the classification task when attractive distractions were presented out of their line of sight than those who formed an implementation intention ($M = 73.50$, $SD = 167.66$), $F(1, 47) = 11.53$, $p < .01$, $\eta^2_p > .19$. Including temperament and language competence as covariates did not change this main effect of shielding intention, $F(1, 45) = 8.03$, $p < .01$, $\eta^2_p > .15$.

Analyzing the looking behavior (turning the head from the classification task screen to the highly attractive movie screen that was presented out of the line of sight), univariate ANOVAs revealed no differences between intention conditions with regard to the absolute frequency of looking at the distraction presented out of sight ($M = 15.38$; $SD = 21.46$), $F < 1$, $p > .72$, $\eta^2_p < .01$, and no differences between the frequency of looking at this distraction for up to 5 s, all F values < 1 , all p values $> .37$, $\eta^2_p < .03$; however, the frequency of looking at this distraction for more than 5 s differed between intention conditions, $F(1, 32) = 3.88$, $p = .06$, $\eta^2_p = .11$. On average, children who formed a shielding goal intention looked once at the distraction for at least 5 s ($M = 0.81$, $SD = 1.65$), whereas children who formed implementation intentions did not look at the distraction for more than 5 s at all ($M = 0.00$, $SD = 0.00$).

Discussion

The findings of the present study suggest that goal intentions directed at shielding an ongoing activity from distractions fail to be effective when the attractiveness of the distractions is rather high. Effective shielding from attractive distractions requires implementation intentions. It should be noted that these differences between goal intentions and implementation intentions were found even though participants in both intention conditions were introduced to the same shielding strategy, namely, to ignore distractions. Apparently, goal intentions to shield an ongoing task performance from distractions have limits: They work only when the targeted distractions are of low attractiveness.

Moreover, compared to goal intentions, implementation intentions also helped children to ignore a continuous attractive distraction (movie sequence) presented out of their sight. Implementation intentions improved resistance to this continuous distraction by reducing the length of time children looked at it, although the frequency of distraction-directed looking remained unchanged. These findings are consistent with Patterson and Mischel (1976), who found that a distraction-inhibiting plan did

not change the frequency but rather the duration of children's looking at the distraction. Additional research is needed to explore whether the impact of distractions on ongoing performance could also be reduced by specifying alternative situational cues in one's implementation intention that do not refer to the distraction, such as "If I am working on my homework" rather than "If a distraction comes up."

Finally, the implementation intention effects on children's shielding performance held up even when controlling for language competence and the personality characteristic of temperament, as well as for age and gender. Although these results should be carefully interpreted because of the rather small sample size, they suggest that children with relatively low as well as those with relatively high levels of effortful control, Kindergarten as well as school children, and boys as well as girls, could benefit equally from implementation intentions.

Conclusions and Outlook

The present study adds to previous research showing that self-verbalization strategies (Meichenbaum & Goodman, 1971), as well as self-instructional plans (Kanfer & Zich, 1974; Patterson & Mischel, 1975) support children's self-control (but see also Cole & Newcombe, 1983). For instance, in a resistance-to-temptation paradigm (Mr. Clown Box), Mischel and Patterson (1976) found that so-called elaborated plans (i.e., concrete plans, such as "When Mr. Clown Box says to look at him and play with him, then you can just say, 'No, I'm not going to look at Mr. Clown Box,'" p. 944) improved self-control more than unelaborated ones did (i.e., abstract plans, such as "When Mr. Clown Box says to look at him and play with him, then you can just think of something to say out loud that will help you not to look at Mr. Clown Box," p. 945). Interestingly, recent research on the limits of action control found that even the execution of reflective plans (e.g., plans specifying strategies, such as double-checking one's first answer in a reasoning task to avoid the common mistake of overlooking relevant stimulus characteristics; Wieber, Odenthal, & Gollwitzer, 2010) can be reflexively elicited by implementation intentions, and that these were successful in improving goal striving in adults. One might, therefore, ask whether adults might have benefitted from the if-then plans in the unelaborated planning condition of Mischel and Patterson's study (1976).

Generally, children's self-control capabilities are assumed to be relatively stable over time (e.g., Eigsti et al., 2006). Certain parenting and socialization conditions, in interaction with child characteristics and environmental factors (e.g., cultural factors; Trommsdorff, 2009, 2010; Trommsdorff & Cole, in press), have been found to promote children's motivation and ability to exert self-control (e.g., Grusec & Davidov, 2007; Karreman, van Tuijl, van

Aken, & Dekovic, 2006). Given the present finding that implementation intentions help children to shield an ongoing task performance from distractions, it would be interesting to examine whether differences in children's self-control can be explained by a parent's use of if-then conditionals. During the development of self-control, a shift from external sources of self-control (primarily parental guidance) to internal mental processes takes place (Kopp, 1982; Trommsdorff, 2007, 2010). Accordingly, external control by parental instructions that are framed in an if-then format may be more effective and may even translate into better self-control by internal mental processes. As another venue for future research, neuropsychological measures could be employed to test whether implementation intentions indeed switch action control in children from a top-down mode (by goals) to a bottom-up mode (by specifying critical stimuli). Lateral prefrontal cortex areas are known to be implicated in the development of children's abilities for effortful control (e.g., Posner & Rothbart, 2007), whereas medial prefrontal areas are involved with bottom-up control (Gilbert, Gollwitzer, Cohen, Oettingen, & Burgess, 2009). Thus, the successful automation of action control by implementation intentions directed at shielding from distractions should be observable by increased activity in the medial prefrontal areas.

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References

- Aarts, H., Dijksterhuis, A. P., & Midden, C. (1999). To plan or not to plan? Goal achievement or interrupting the performance of mundane behaviors. *European Journal of Social Psychology*, 29, 971–979.
- Achtziger, A., Gollwitzer, P. M., & Sheeran, P. (2008). Implementation intentions and shielding goal striving from unwanted thoughts and feelings. *Personality and Social Psychology Bulletin*, 34, 381–393.
- Ayduk, O., Mendoza-Denton, R., Mischel, W., Downey, G., Peake, P., & Rodriguez, M. (2000). Regulating the interpersonal self: Strategic self-regulation for coping with rejection sensitivity. *Journal of Personality and Social Psychology*, 79, 776–792.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Barkley, R. A. (1997). *ADHD and the nature of self-control*. New York: Guilford.
- Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. San Diego: Academic.
- Bayer, U. C., Achtziger, A., Gollwitzer, P. M., & Moskowitz, G. B. (2009). Responding to subliminal cues: Do if-then plans cause action preparation and initiation without conscious intent? *Social Cognition*, 27, 183–201.
- Brandstätter, V., Lengfelder, A., & Gollwitzer, P. M. (2001). Implementation intentions and efficient action initiation. *Journal of Personality and Social Psychology*, 81, 946–960.
- Calkins, S. D., & Williford, A. P. (2009). Taming the terrible twos: Self-regulation and school readiness. In O. A. Barbarin & B. H. Wasik (Eds.), *Handbook of child development and early education: Research to practice* (pp. 172–198). New York: Guilford.
- Chapman, J., Armitage, C. J., & Norman, P. (2009). Comparing implementation intention interventions in relation to young adults' intake of fruit and vegetables. *Psychology & Health*, 24, 317–332.
- Cole, P. M., & Newcombe, N. (1983). Interference effects of verbal and imaginal strategies for resisting distraction on children's verbal and visual recognition memory. *Child Development*, 54, 42–50.
- Dreisbach, G., & Haider, H. (2009). How task representations guide attention: Further evidence for the shielding function of task sets. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 35, 477–486.
- Eigsti, I.-M., Zayas, V., Mischel, W., Shoda, Y., Ayduk, O., Dadlani, M. B., . . . Casey, B. J. (2006). Predicting cognitive control from preschool to late adolescence and young adulthood. *Psychological Science*, 17, 478–484.
- Eisenberg, N., Fabes, R., Guthrie, I., & Reiser, M. (2000). Dispositional emotionality and regulation: Their role in predicting quality of social functioning. *Journal of Personality and Social Psychology*, 78, 136–157.
- Eisenberg, N., Hofer, C., & Vaughan, J. (2007). Effortful control and its socioemotional consequences. In J. J. Gross (Ed.), *Handbook of emotion regulation* (pp. 287–306). New York: Guilford.
- Eisenberg, N., & Sadovsky, A. (2006). Bridging developmental and social psychology. In P. A. M. Van Lange (Ed.), *Bridging social psychology: Benefits of transdisciplinary approaches* (pp. 225–231). Mahwah, NJ: Erlbaum.
- Eisenberg, N., Smith, C. L., Sadovsky, A., & Spinrad, T. L. (2004). Effortful control: Relations with emotion regulation, adjustment, and socialization in childhood. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 259–282). New York: Guilford.
- Genshaft, J. (1983). A comparison of techniques to increase children's resistance to temptation. *Personality and Individual Differences*, 4, 339–341.
- Gilbert, S., Gollwitzer, P. M., Cohen, A.-L., Oettingen, G., & Burgess, P. W. (2009). Separable brain systems supporting cued

- versus self-initiated realization of delayed intentions. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 35, 905–915.
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, 54, 493–503.
- Gollwitzer, P. M., & Brandstätter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology*, 73, 186–199.
- Gollwitzer, P. M., & Schaal, B. (1998). Metacognition in action: The importance of implementation intentions. *Personality and Social Psychology Review*, 2, 124–136.
- Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 38, pp. 69–119). San Diego: Elsevier.
- Goschke, T., & Dreisbach, G. (2008). Conflict-triggered goal shielding: Response conflicts attenuate background monitoring for prospective memory cues. *Psychological Science*, 19, 25–32.
- Grimm, H., & Schöler, H. (1991). *Heidelberger Sprachentwicklungstest HSET* [Heidelberger Test of Language Development] (2nd ed.). Braunschweig, Germany: Westermann.
- Grolnick, W. S., Farkas, M., & Bornstein, M. H. (2002). Parenting and the development of children's self-regulation. *Handbook of parenting: Practical issues in parenting* (2nd ed., Vol. 5, pp. 89–110). Mahwah, NJ: Erlbaum.
- Grusec, J. E., & Davidov, M. (2007). Socialization in the family: The roles of parents. In J. E. Grusec & P. D. Hastings (Eds.), *Handbook of socialization: Theory and research* (pp. 284–308). New York: Guilford.
- Hartig, M., & Kanfer, F. H. (1973). The role of verbal self-instructions in children's resistance to temptation. *Journal of Personality and Social Psychology*, 25, 259–267.
- Kanfer, F. H., & Zich, J. (1974). Self-control training: The effects of external control on children's resistance to temptation. *Developmental Psychology*, 10, 108–115.
- Karreman, A., van Tuijl, C., van Aken, M. A. G., & Dekovic, M. (2006). Parenting and self-regulation in preschoolers: A meta-analysis. *Infant and Child Development*, 15, 561–579.
- Kochanska, G., & Knaack, A. (2003). Effortful control as a personality characteristic of young children: Antecedents, correlates, and consequences. *Journal of Personality*, 71, 1087–1112.
- Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology*, 36, 220–232.
- Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology*, 18, 199–214.
- McCabe, L. A., Cunningham, M., & Brooks-Gunn, J. (2004). The development of self-regulation in young children: Individual characteristics and environmental contexts. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 340–356). New York: Guilford.
- Meichenbaum, D. H., & Goodman, J. (1971). Training impulsive children to talk to themselves: A means of developing self-control. *Journal of Abnormal Psychology*, 77, 115–126.
- Mischel, W., & Patterson, C. J. (1976). Substantive and structural elements of effective plans for self-control. *Journal of Personality and Social Psychology*, 34, 942–950.
- Mischel, W., Shoda, Y., & Peake, P. K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology*, 54, 687–696.
- Parks-Stamm, E. J., Gollwitzer, P. M., & Oettingen, G. (2010). Implementation intentions and test anxiety: Shielding academic performance from distraction. *Learning and Individual Differences*, 20, 30–33.
- Patterson, C. J., & Mischel, W. (1975). Plans to resist distraction. *Developmental Psychology*, 11, 369–378.
- Posner, M. I., & Rothbart, M. K. (2007). Research on attention networks as a model for the integration of psychological science. *Annual Review of Psychology*, 58, 1–23.
- Rothbart, M. K., & Bates, J. (2006). Temperament. In N. Eisenberg, W. Damon, & L. M. Richard (Eds.), *Handbook of child psychology: Social emotional, and personality development* (6th ed., Vol. 3, pp. 99–166). Hoboken, NJ: Wiley.
- Rothbart, M. K., Ahadi, S. A., Hersey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development*, 72, 1394–1408.
- Rothbart, M. K., Ellis, L. K., & Posner, M. I. (2004). Temperament and self-regulation. In R. F. Baumeister & K. D. Vohs (Eds.), *Handbook of self-regulation: Research, theory, and applications* (pp. 357–370). New York: Guilford.
- Shah, J. Y., Friedman, R., & Kruglanski, A. W. (2002). Forgetting all else: On the antecedents and consequences of goal shielding. *Journal of Personality and Social Psychology*, 83, 1261–1280.
- Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology*, 26, 978–986.
- Suchodolez, A. v., Trommsdorff, G., Heikamp, T., Wieber, F., & Gollwitzer, P. M. (2009). Transition to school: The role of kindergarten children's behavior regulation. *Learning and Individual Differences*, 19, 561–566.
- Trommsdorff, G. (2007). Intentionality of action in cultural context. In J. Wassmann & K. Stockhaus (Eds.), *Experiencing new worlds* (Vol. 1, pp. 58–77). New York: Berghahn.
- Trommsdorff, G. (2009). Culture and development of self-regulation. *Personality and Social Psychology Compass*, 3, 687–701.
- Trommsdorff, G. (2010). *Development of agency and self-regulation from a culture-informed perspective*. Manuscript submitted for publication.
- Trommsdorff, G., & Cole, P. M. (in press). Emotion, self-regulation, and social behavior in cultural contexts. In X. Chen & K. H. Rubin (Eds.), *Socioemotional development in cultural context*. New York: Guilford.
- Veling, H., & van Knippenberg, A. (2006). Shielding intentions from distraction: Forming an intention induces inhibition of distracting stimuli. *Social Cognition*, 24, 409–425.
- Webb, T. L., & Sheeran, P. (2003). Can implementation intentions help to overcome ego-depletion? *Journal of Experimental Social Psychology*, 39, 279–286.
- Webb, T. L., & Sheeran, P. (2008). Mechanisms of implementation intention effects: The role of goal intentions, self-efficacy, and accessibility of plan components. *British Journal of Social Psychology*, 47, 373–395.
- Wieber, F., & Sassenberg, K. (2006). I can't take my eyes off of it – Attention attraction effects of implementation intentions. *Social Cognition*, 24, 723–752.
- Wieber, F., Odenthal, G., & Gollwitzer, P. M. (2010). Self-efficacy feelings moderate implementation intention effects. *Self and Identity*, 9, 177–194.

- Winsler, A., Diaz, R. M., McCarthy, E. M., Atencio, D. J., & Chabay, L. A. (1999). Mother-child interaction, private speech, and task performance in preschool children with behavior problems. *Journal of Child Psychology and Psychiatry*, 40, 891–904.
- Zelazo, P. D., Carter, A., Reznick, J. S., & Frye, D. (1997). Early development of executive function: A problem-solving framework. *Review of General Psychology*, 1, 198–226.

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